Journal of Current Hematology & Oncology Research

Original Article

DOI: 10.51271/JCHOR-0009

Gastric cancer patient characteristics in a city in the Central Anatolian Region of Turkey: a single-center descriptive study

Mustafa Büyükkör[1], Fatih Tay[1], Ayşegül Özakyol Harmancı[2]

[1]Department of Medical Oncology, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, Ankara, Turkey
[2]Division of Gastroenterology, Deaprtment of Internal Medicine, Faculty of Medicine, Eskişehir Osmangazi University, Eskişehir, Turkey

Cite this article: Büyükkör M, Tay F, Özakyol Harmancı A. Gastric cancer patient characteristics in a city in the Central Anatolian Region of Turkey: a single-center descriptive study. *J Curr Hematol Oncol Res.* 2023;1(2):36-40.

Corresponding Author: Mustafa Büyükkör, mbuyukkor@hotmail.com

Received: 02/05/2023 ◆ **Accepted**: 23/05/2023 ◆ **Published**: 29/05/2023

ABSTRACT

Aims: This study aimed to determine the characteristics of patients with gastric cancer living in Eskişehir, a city located in the central Anatolian region of Turkey, together with factors affecting the recurrence and survival time.

Methods: This descriptive cross-sectional study was conducted using patients records who were admitted to Eskişehir Osmangazi University Health Practice and Research Hospital, Department of Internal Medicine between December 1998 and January 2011 with a diagnosis of gastric cancer. Missing data was obtained by calling the patients or their relatives by phone.

Results: We evaluated 210 gastric cancer patients in this study.Male sex was approximately 2.5 times dominant, and most of the patients were diagnosed between the ages of 60-69. Approximately 1/5th of the patients applied to the health center 6 months after the onset of symptoms. Age, chemotherapy, and radiotherapy were significantly related to recurrence (p=0.028, p=0.009, and p=0.005, respectively). Stage, area of involvement, positive surgical margin, chemotherapy, radiotherapy, and the number of lymph nodes removed were significantly related to survival time (p<0.001 for all variables).

Conclusion: In the studied population, gastric cancer diagnosis is delayed in a significant proportion of symptomatic patients. To decrease missed diagnoses, health professionals, especially those working in primary health care, should be made more sensitive towards the red flags of gastric cancer. Chemotherapy and radiotherapy are effective treatment options in preventing recurrences and improving survival.

Keywords: Gastric cancer, diagnosis, survival, recurrence, chemotherapy, radiotherapy

INTRODUCTION

Gastric cancer (also called stomach cancer) is a significant global health burden, with approximately one million people newly diagnosed each year.[1] In fact, despite its decreasing prevalence over the past few decades, it is the third most common cause of cancer-related death after lung and colorectal cancer.[2,3] Furthermore, gastric cancer is among the most common cancers in Turkey (5th in men, 6th in women), with an incidence of 12.6 per 100,000.[4]

Gastric cancer risk factors can be summarized under four headings: Environmental factors (such as diet, smoking, socioeconomic status, alcohol, ionizing radiation, and Epstein-Barr virus), genetic factors (e.g., sex, blood type, and familial predisposition), Helicobacter pylori infection, and precancerous mucosal changes.[5,6]

Early diagnosis is vital for these types of cancers. As a matter of fact, the five-year survival rate of patients treated at an early-stage (before reaching the muscular layer of the stomach) is close to 95%, while the median survival of patients with advanced cancer who do not have an indication for surgery is around 9-10 months.[7,8]

Surgery, radiotherapy, or chemotherapy can be used alone or in combination in the treatment of stomach cancer. Surgical cure can be achieved only in gastric cancers detected at an early-stage (before stage 2). Additionally, targeted therapies (such as trastuzumab and ramucirumab) are used in advanced stages while immunotherapies are used in both locally advanced and advanced stages of gastric cancer.[9]

As in the case of Japan, early diagnosis and screening strategies focused on high-risk populations can reduce deaths associated with gastric cancers.[10] It was thought that investigating the characteristics of patients diagnosed with gastric cancer in Eskişehir (Central Anatolia/Turkey), where our hospital is located, may contribute to the identification of high-risk individuals. Furthermore, information obtained

This work is licensed under a Creative Commons Attribution 4.0 International License.

locally about gastric cancer risk factors may contribute to regional planning, evaluations, and treatment strategies.

Objective

This study aimed to determine the characteristics of patients with gastric cancer living in Eskişehir, a large city in the central Anatolian region of Turkey, together with factors related to the recurrence and survival time.

METHODS

Ethical approval (numbered 3010/273, dated 05.11.2010) was received from the Eskişehir Osmangazi University Health Practice and Research Hospital Clinical Research Ethics Committee. The reporting of the study was done according to the STROBE guideline.[11] All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Study Design

This descriptive cross-sectional study was conducted with patients who were admitted to Eskişehir Osmangazi University Health Practice and Research Hospital, Department of Internal Medicine, between December 1998 and January 2011 with a diagnosis of gastric cancer. Patient data were obtained from patient files and the hospital automation system. Besides, missing information from patients who did not come for control for a long time was obtained by calling their homes.

Setting

The study was conducted in Eskişehir Osmangazi University Health Practice and Research Hospital. The hospital where the research was conducted is a tertiary hospital with 1010 inpatient beds. During the study times, the medical oncology department of the hospital was the only center serving cancer cases in the region.

Participants

219 Patients over 18 who were diagnosed with primary gastric cancer were screened,[4] patients who were not followed up in our hospital (who applied only once) and 5 metastatic gastric patients with missing data and couldn't got information about by calling were excluded. In conclusion 210 patients with all stages gastric cancer were included in the study (**Figure 1**).

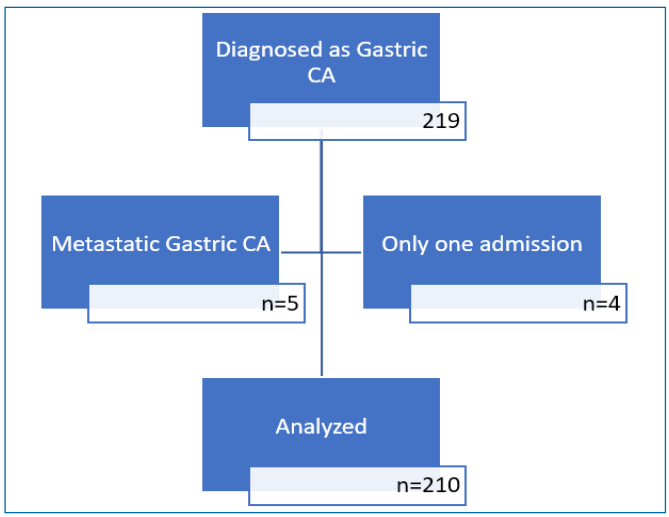

Figure 1. Participant flow chart

Variables

The primary variable of the study was determined as survival time. Additionally, patients' age at diagnosis, sex, blood type, tumor localization, tumor type, stage (TNM classification), degree of differentiation, presence of vascular invasion or perineural invasion, lymph node involvement, surgical margin positivity, postoperative chemotherapy or postoperative radiotherapy, number of removed lymph nodes were the other variables examined.

The sample size was not calculated since all patients were intended to be included in the study.

Statistical Analysis

Statistical analysis was performed via the Statistical Package for the Social Sciences (SPSS) (SPSS for Windows, Version SPSS 20.0, Chicago, IL, USA) program. If the variables were numerical, they were presented as mean and standard deviations, and if categorical, frequencies and percentages were given. Normal distribution was evaluated by the Kolmogorov-Smirnov test. Continuous variables were compared using the Mann-Whitney U test. The Chi-square (or Fisher's exact) test was used to compare categorical variables. The Cox regression analysis was performed to detect independent factors on survival. A p-value of less than 0.05 was considered sufficient for statistical significance.

RESULTS

Participants

Most of the patients were male with a male/female ratio of approximately 2.5, and most of them were diagnosed between the ages of 60-69. Adenocarcinoma was the most common histologic type. Approximately 1/5th of the patients applied to the health center 6 months after the onset of symptoms (**Table 1**).

There was a significant difference regarding recurrence in age, chemotherapy, and radiotherapy variables (**Table 2**).

Survival time was lower in cases involving cancer in the proximal plus corpus region and corpus plus distal region than in other areas. Additionally, the survival time of the cases with stages 3-4 was lower. Furthermore, survival times of patients without surgical indication and positive surgical margins were lower than those who underwent R0 resection. Patients who received adjuvant chemotherapy had a longer life expectancy than those who did not. On the other hand, the survival times of those who received palliative chemotherapy were lower. According to the postoperative staging, the life expectancy of patients who received concomitant chemoradiotherapy was higher than those who did not. The survival of patients whose lymph nodes could not be removed or who had no indication for surgery was lower than those whose lymph nodes were removed (**Table 3**).

In the univariate analysis, it was observed that the treatment applied in patients who received chemoradiotherapy had aproximately threefold better survival compared to those who did not. (**Table 4**).

DISCUSSION

Key Results

Most of the patients were male with a male/female ratio of approximately 2.5, and most of them were diagnosed between the ages of 60-69. Approximately 1/5th of the patients applied to the health center 6 months after the onset of symptoms. Age, chemotherapy, and radiotherapy were

significantly related to the recurrence. In addition, stage, area of involvement, surgical margin positivity, chemotherapy, radiotherapy, and the number of lymph nodes removed were significantly related to survival time.

Limitations

Since the information about the patients was based on the records, some additional confounding factors that could affect the primary outcome variables, such as diabetes and genetic predisposition, were not included in the study. Another limitation is the amount of missing data due to the retrospective nature of the investigation.

Table 1. Descriptive characteristics of patients

	n	%
Sex		
Male	150	71.4
Female	60	28.6
Age at diagnosis (years)		
≤49	40	19
50-59	51	24.3
60-69	71	33.8
≥70	48	22.9
Blood type		
A	88	41.9
B	33	15.7
O	32	15.2
AB	22	10.5
Unknown	35	16.7
Hemoglobin (mg/dl)		
≥10	157	74.8
<10	53	25.2
Smoking		
Absent	97	46.2
Present	113	53.8
Lymphoid invasion		
Absent	25	12
Present	113	54
Unknown	72	34
Vascular invasion		
Absent	54	26
Present	57	27
Unknown	99	47
Perineural invasion		
Absent	49	23
Present	61	29
Unknown	100	48
Area of involvement		
Proximal	45	21.4
Corpus	36	17.1
Distal	93	44.3
Proximal + corpus	21	10
Corpus + distal	15	7.1
Stage		
Stage 1-2	67	31.9
Stage 3-4	143	68.1
Grade		
Well differentiated	30	14.3
Moderately differentiated	91	43.3
Poorly differentiated	89	42.4
Histologic type		
Adenocarcinoma	158	75.2
Signet ring cell cancer	23	11
Signet ring component adenocarcinoma	28	13.3
Other	1	0.5
Admission after symptom onset		
0-6 months	175	83.4
7-12 months	19	9.0
>12 months	16	7.6

Table 2. Comparison of treatments and patient characteristics by recurrence status

	Recurrence						p
	Absent		0-12 months		≥ 13 months		
	n	%	n	%	n	%	
Age (years)							0.028
≤49	26	65.0	8	20	6	15	
50-59	38	74.5	7	13.7	6	11.8	
60-69	54	76.1	11	15.5	6	8.5	
≥70	46	95.8	2	4.2	0	0	
Sex							0.330
Male	121	80.7	17	11.3	12	8	
Female	43	71.7	11	18.3	6	10	
Place of involvement							0.703
Proximal	35	77.8	7	15.6	3	6.7	
Corpus	29	80.6	6	16.7	1	2.8	
Distal	72	77.4	10	10.8	11	11.8	
Proximal + corpus	16	76.2	4	19.0	1	4.8	
Corpus + distal	12	80.0	1	6.7	2	13.3	
Grade							0.474
Well differentiated	24	80.0	4	13.3	2	6.7	
Moderately differentiated	74	81.3	8	8.8	9	9.9	
Poorly differentiated	66	74.1	16	18.0	7	7.9	
Lymphoid invasion							0.542
Absent	21	84.0	2	8.0	2	8.0	
Present	83	73.5	15	13.3	15	13.3	
Vascular invasion							0.922
Absent	39	72.2	7	13.0	8	14.8	
Present	42	73.7	8	14.0	7	12.3	
Perineural invasion							0.565
Absent	34	69.4	7	14.3	8	16.3	
Present	47	77.0	8	13.1	6	9.8	
Chemotherapy							0.009
Absent	31	96.9	0	0	1	3.1	
Adjuvant	92	74.8	16	13.0	15	12.2	
Palliative	41	74.5	12	21.8	2	3.6	
Radiotherapy							0.045
Absent	143	80.4	20	11.2	15	8.4	
Curative	13	81.3	2	12.5	1	6.2	
Palliative	8	50.0	6	37.5	2	12.5	

Interpretation

Stomach cancer is one of the most common types of cancer. However, it does not show any specific signs or symptoms that can be considered pathognomonic for gastric cancer.[12] On the other hand, studies have demonstrated that some factors such as age, diet, bacterial infection, pernicious anemia, gender, race, environment, gastric surgery history, and blood type increase the risk.[12-16]

Early diagnosis of gastric cancer is very important in terms of prognosis. As a matter of fact, while the 5-year survival rate is 15-25% in advanced-stage tumors, this rate reaches 90% when diagnosed at an earlier stage.[13] Early diagnosis of gastric cancer and better control of the risk factors can reduce its global incidence.[12] Stomach cancers are usually diagnosed at a late stage because the lesions do not show obvious symptoms until then. While 40% of stomach cancers are diagnosed early in Japan. this rate is around 15% in Europe.[17]

The six-month delay in the investigation of gastric cancer after symptoms appeared in approximately one-fifth of the patients suggested that primary care professionals, who are the first encounter with the patient, should be informed about this issue. Similarly, the fact that most diagnosed patients are at an advanced-stage also supports this interpretation.

Table 3. Comparison of patients' characteristics regarding survival time

	Survival time (months)			p
	Median	Minimum	Maximum	
Age (years)				0.069
≤49	16	8	24	
50-59	12	10	14	
60-69	13	10	16	
≥70	9	6	12	
Sex				0.401
Male	11	9	13	
Female	11	9	13	
Stage				<0.001
Stage 1-2	20	14	26	
Stage 3-4	10	8	12	
Area of involvement				<0.001
Proximal	12	9	15	
Corpus	11	7	15	
Distal	14	11	17	
Proximal + corpus	6	4	8	
Corpus + distal	6	0	13	
Surgical margin				<0.001
Not operated	4	3	5	
R0	16	12	20	
R1	7	1	13	
R2	12	9	15	
Grade				0.230
Well differentiated	14	11	17	
Moderately differentiated	11	8	14	
Poorly differentiated	10	7	13	
Chemotherapy				<0.001
Absent	4	3	5	
Adjuvant	16	12	20	
Palliative	6	4	8	
Chemoradiotherapy				<0.001
Absent	7	4	10	
Present	20	15	25	
Histologic type				0.547
Adenocarcinoma	11	8	14	
Signet ring cell cancer	10	7	13	
Signet ring component adenocarcinoma	12	9	15	
Number of lymph nodes removed				<0.001
0	5	4	6	
1-10	15	10	20	
11-20	19	13	25	
>21	12	9	15	

Table 4. Cox-regression output showing chemoradiotherapy effects on survival

	B	Wald	p	Exp(B)	95.0% CI for Exp(B)	
					Lower	Upper
Chemoradiotherapy	1.026	6.982	0.008	2.791	1.303	5.974

Gastric cancer, which is more common in men compared to women, mostly affects older populations. However, the incidence of this cancer has increased dramatically in recent years, especially in patients under the age of 40.[18] Its incidence increases after the age of 50 and reaches its highest level between the ages of 60 and 70. The incidence of gastric cancer before the age of 30 is very rare.[9,18,19] The findings in this study are compatible with the literature in terms of both sex and age.

The risk of gastric cancer is higher in patients with blood group A than in individuals with other blood groups, whereas the risk of gastric cancer in individuals with blood group O is lower than those with non-O blood groups.[20] However, there are also studies reporting that the frequency of the AB blood group is lower in patients with gastric cancer than in other blood groups.[21] Therefore, the findings in this study are also compatible with the literature. Unfortunately, the blood group of 16.7% of the patients could not be reached. Therefore, it may be misleading to make a precise assessment regarding which blood group is rarer.

According to Kato et al.[22] the antrum involvement rate was determined as 71% in gastric cancer samples taken from 4147 cases in approximately 20 years. Also, in our study, involvement in the antrum region was detected more frequently. However, the rate was lower than the study of Kato et al. Variables such as dietary habits. genetic features. and environmental factors may have played a role in this difference.

Despite curative surgery, gastric cancer can often relapse. By defining the clinical and pathological factors that are effective in the development of relapse, more rigorous treatment protocols can be determined. In a study conducted by Dittmar et al.[23] on 272 patients, they stated that the rate of local recurrence was more in younger patients with gastric cancer, and they did not detect a significant difference in recurrence according to the site of involvement. Even in our study, no relationship was found between the site of involvement and recurrence, and recurrence was rarer in individuals over the age of 70.

In one study, 311 of 1795 patients who underwent gastrectomy had recurrence.[24] In this study, the recurrence rate was higher in patients with poorly differentiated type, lymphoid invasion, perineural invasion, vascular invasion, and patients with fewer lymph nodes removed during the operation. However, in our study, differentiation, lymphoid invasion, vascular invasion, and recurrence of perineural invasion did not increase significantly. The reason for this difference detected in the findings may be the difference in the number of patients examined. In addition, the surgical method and the treatment protocols may have affected the results because, in our study, a significant effect of chemotherapy and radiotherapy on recurrence was observed. Further studies are needed to clarify this situation.

Chemotherapy and radiotherapy also have a positive effect on survival in patients with gastric cancer.[25] In line with the literature, the findings of our study confirmed that chemotherapy and radiotherapy are positively related to survival.

In a study with 2613 patients, advanced-stage, upper third location, palliative resection, and poor differentiation were related to poor survival.[26] On the other hand, in a study conducted with 773 patients, tumor localization and gender did not have an effect on survival, while poor differentiation negatively affected survival.[27] Age and gender did not significantly affect survival time.[27,28] The findings of our study were consistent with studies claiming that localization reduces survival time. Besides, survival was significantly lower in advanced cases. Although it did not reach a statistically significant level in our study, the least median survival time was in the poorly differentiated group in accordance with the literature.

Regardless of tumor location, the general view is to obtain as many lymph nodes as possible with R0 resection and extensive lymph node dissection. The depth of invasion of the tumor, presence of lymph node metastases, number

of lymph nodes removed. and presence of distant metastases are important factors determining the prognosis.[29] Lymph node status, depth of invasion. development of postoperative complications. presence of distant metastases, and tumor diameter were associated with prognosis.[30] Also, in our study, the number of lymph nodes removed, tumor size, and surgical margin were associated with survival.

CONCLUSION

In the central Anatolian region of Turkey, the diagnosis of gastric cancer is delayed in a significant proportion of the patients who have symptoms. In order to solve this problem. it should be ensured that health professionals, especially those working in primary health care, are more aware and sensitive regarding the alarming symptoms of gastric cancer. Chemotherapy and radiotherapy are effective treatment options in both preventing recurrences and improving survival.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Eskişehir Osmangazi University Health Practice and Research Hospital Clinical Research Ethics Committee (Date: 05.11.2010, Decision No: 3010/273).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

REFERENCES

1. Thrift AP, El-Serag HB. Burden of gastric cancer. *Clin Gastroenterol Hepatol.* 2020;18(3):534-542. doi:10.1016/j.cgh.2019.07.045
2. Waldum H, Fossmark R. Gastritis, gastric polyps and gastric cancer. *Int J Mol Sci.* 2021;22(12):6548. doi:10.3390/ijms22126548
3. Rawla P, Barsouk A. Epidemiology of gastric cancer: global trends, risk factors and prevention. *Prz Gastroenterol.* 2019;14(1):26-38. doi:10.5114/pg.2018.80001
4. Organization WH. Estimated Age-Standardized Incidence Rates (World) in 2020. All cancers. Both Sexes. All Ages. 2020.
5. Karimi P, Islami F, Anandasabapathy S, Freedman ND, Kamangar F. Gastric cancer: descriptive epidemiology, risk factors, screening, and prevention. *Cancer Epidemiol Biomarkers Prev.* 2014;23(5):700-713. doi:10.1158/1055-9965.EPI-13-1057
6. Yusefi AR, Bagheri Lankarani K, Bastani P, Radinmanesh M, Kavosi Z. Risk factors for gastric cancer: a systematic review. *Asian Pac J Cancer Prev.* 2018;19(3):591-603. doi:10.22034/APJCP.2018.19.3.591
7. Ajani JA, D'Amico TA, Almhanna K, et al. Gastric cancer, version 3.2016, NCCN clinical practice guidelines in oncology. *J Natl Compr Canc Netw.* 2016;14(10):1286-1312. doi:10.6004/jnccn.2016.0137
8. Ajani JA, Lee J, Sano T, Janjigian YY, Fan D, Song S. Gastric adenocarcinoma. *Nat Rev Dis Primers.* 2017;3:17036. doi:10.1038/nrdp.2017.36
9. Machlowska J, Baj J, Sitarz M, Maciejewski R, Sitarz R. Gastric cancer: epidemiology, risk factors, classification, genomic characteristics and treatment strategies. *Int J Mol Sci.* 2020;21(11):4012. doi:10.3390/ijms21114012
10. Mizota Y, Yamamoto S. How long should we continue gastric cancer screening? From an epidemiological point of view. *Gastric Cancer.* 2019;22(3):456-462. doi:10.1007/s10120-018-0877-z
11. von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol.* 2008;61(4):344-349. doi:10.1016/j.jclinepi.2007.11.008
12. Zhang W, Li Z, Akram MS, et al. Gastric cancer screening methods: a comparative study of two scoring methods. *Cancer Manag Res.* 2021;13:5785-5791. doi:10.2147/CMAR.S308395
13. Sumiyama K. Past and current trends in endoscopic diagnosis for early-stage gastric cancer in Japan. *Gastric Cancer.* 2017;20(Suppl 1):20–7. doi: 10.1007/s10120-016-0659-4
14. Bartfeld S, Bayram T, van de Wetering M, et al. In vitro expansion of human gastric epithelial stem cells and their responses to bacterial infection. *Gastroenterology.* 2015;148(1):126-136.e6. doi:10.1053/j.gastro.2014.09.042
15. Shimada S, Sawada N, Ishiyama Y, et al. Impact of obesity on short- and long-term outcomes of laparoscopy assisted distal gastrectomy for gastric cancer. *Surg Endosc.* 2018;32(1):358-366. doi:10.1007/s00464-017-5684-9
16. Alkebsi L, Ideno Y, Lee JS, et al. Gastroduodenal ulcers and ABO blood group: the Japan Nurses' Health Study (JNHS). *J Epidemiol.* 2018;28(1):34-40. doi:10.2188/jea.JE20160204
17. Hohenberger P, Gretschel S. Gastric cancer. *Lancet.* 2003;362(9380):305-315. doi:10.1016/s0140-6736(03)13975-x
18. Wong MCS, Huang J, Chan PSF, et al. Global incidence and mortality of gastric cancer, 1980-2018. *JAMA Netw Open.* 2021;4(7):e2118457. doi:10.1001/jamanetworkopen.2021.18457
19. Joharatnam-Hogan N, Shiu KK, Khan K. Challenges in the treatment of gastric cancer in the older patient. *Cancer Treat Rev.* 2020;85:101980. doi:10.1016/j.ctrv.2020.101980
20. Wang Z, Liu L, Ji J, et al. ABO blood group system and gastric cancer: a case-control study and meta-analysis. *Int J Mol Sci.* 2012;13(10):13308-13321. Published 2012 Oct 17. doi:10.3390/ijms131013308
21. Yu H, Xu N, Li ZK, et al. Association of ABO Blood Groups and Risk of Gastric Cancer. *Scand J Surg.* 2020;109(4):309-313. doi:10.1177/1457496919863886
22. Kato Y, Kitagawa T, Nakamura K, Sugano H. Changes in the histologic types of gastric carcinoma in Japan. *Cancer.* 1981;48(9):2084-2087. doi:10.1002/1097-0142(19811101)48:9<2084::aid-cncr2820480928>3.0.co;2-8
23. Dittmar Y, Rauchfuss F, Götz M, Scheuerlein H, Jandt K, Settmacher U. Impact of clinical and pathohistological characteristics on the incidence of recurrence and survival in elderly patients with gastric cancer. *World J Surg.* 2012;36(2):338-345. doi:10.1007/s00268-011-1395-x
24. Choi JY, Ha TK, Kwon SJ. Clinicopathologic characteristics of gastric cancer patients according to the timing of the recurrence after curative surgery. *J Gastric Cancer.* 2011;11(1):46-54. doi:10.5230/jgc.2011.11.1.46
25. Mansouri H, Zemni I, Achouri L, et al. Chemoradiotherapy or chemotherapy as adjuvant treatment for resected gastric cancer: should we use selection criteria?. *Rep Pract Oncol Radiother.* 2021;26(2):266-280. doi:10.5603/RPOR.a2021.0040
26. Zhang XF, Huang CM, Lu HS, et al. Surgical treatment and prognosis of gastric cancer in 2,613 patients. *World J Gastroenterol.* 2004;10(23):3405-3408. doi:10.3748/wjg.v10.i23.3405
27. Patel PR, Yao JC, Hess K, Schnirer I, Rashid A, Ajani JA. Effect of timing of metastasis/disease recurrence and histologic differentiation on survival of patients with advanced gastric cancer. *Cancer.* 2007;110(10):2186-2190. doi:10.1002/cncr.23046
28. Rohatgi PR, Yao JC, Hess K, et al. Outcome of gastric cancer patients after successful gastrectomy: influence of the type of recurrence and histology on survival. *Cancer.* 2006;107(11):2576-2580. doi:10.1002/cncr.22317
29. Asoglu O, Karanlik H, Parlak M, et al. Metastatic lymph node ratio is an independent prognostic factor in gastric cancer. *Hepatogastroenterology.* 2009;56(91-92):908-913.
30. Siewert JR, Böttcher K, Stein HJ, Roder JD. Relevant prognostic factors in gastric cancer: ten-year results of the German gastric cancer study. *Ann Surg.* 1998;228(4):449-461. doi:10.1097/00000658-199810000-00002